Percutaneous balloon fenestration in a case of traumatic abdominal aortic dissection with lower extremity ischemia

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A 38-year-old man was involved in a traffic accident and experienced a heavy blow to the abdomen. He had traumatic abdominal aortic dissection with right lower extremity ischemia. He underwent percutaneous balloon fenestration, which is safe and minimally invasive, for relief of right lower extremity ischemia. He has been working for 2 years without any signs of vascular compromise. Percutaneous balloon fenestration is one of the few treatments for traumatic abdominal aortic dissection. (J Vasc Surg 2000;32: 616-8)

Abdominal aortic injury after abdominal blunt trauma is a rare[1] and dangerous emergency disorder that can cause serious complications. Because traumatic abdominal aortic dissection is extremely rare,[1] it can be misdiagnosed. We report a case of lower extremity ischemia due to traumatic abdominal aortic dissection that was successfully treated with percutaneous balloon fenestration.

CASE REPORT

A 38-year-old man was involved in a traffic accident and experienced a heavy blow to the abdomen at 3 PM on August 16, 1997. He experienced coldness of his right lower extremity and severe abdominal pain. He was referred to the First Department of Surgery at 5 PM, and small intestinal injuries were diagnosed. He underwent immediate partial resection of the ileum and drainage. During the operation, at 11 PM, he was referred to our department because of cyanosis of his right lower extremity, which was suspected of being ischemic.

Using the intraoperative ultrasound technique, we confirmed that he had aortic dissection from the infrarenal abdominal aorta to the aortic bifurcation, with limited flow in the right common iliac artery due to the intimal flap. However, there was no aneurysm or rupture in the aortoiliac segment. As the ankle / brachial index (ABI) of his right lower extremity remained at 0.7, we decided not to treat the relative ischemia as an emergency situation. He had a good postoperative course, but he was transferred to our department on September 22, 1997, exhibiting intermittent claudication of 20 m. The femoral pulse of his right groin could be felt faintly, and the pressure index of the femoral segment was 0.77. The ABI was 0.78 on the right side and 1.11 on the left side. Abdominal radiography, electrocardiography, and blood testing showed no abnormal findings. Computerized tomography (CT) did not show dissection in the thoracic aorta, but an apparent intimal flap was observed from 2 cm below the level of the renal artery to the aortic bifurcation, without thrombus in the false lumen. Aortography showed no apparent reentry, and the false lumen looked like a blind alley. This wide false lumen oppressed the true lumen, so that the flow of the right common iliac artery was markedly reduced (Fig 1). There were no aneurysms in the aortoiliac segment. The patient did not want to undergo a direct operation because he was worried about sexual dysfunction as a possible operative complication. We therefore selected percutaneous balloon fenestration for treatment in this case.

With the patient under general anesthesia, an 8.5-F introducer was inserted in the right common femoral artery according to the method of Seldinger. A guide wire was inserted from the right common femoral artery to the right common iliac artery, and an 8-F Brockenbrough introducer (Medtronic, Inc, Minneapolis, Minn) was then advanced at the common iliac artery over the guide wire. After the location of the tip of the needle was confirmed by means of fluoroscopy, the intimal flap was pierced 1 cm above the aortic bifurcation with a Brockenbrough needle (Medtronic, Inc). After removal of the Brockenbrough needle, the guide wire was advanced through the introducer and passed into the false lumen. After the proper position of fenestration was confirmed by means of fluoroscopy, the introducer was removed and an angioplasty balloon catheter (Boston Scientific, Watertown, Mass) with a diameter of 9 mm and a length of 4 cm was advanced to the position of the intimal flap. The balloon was inflated against the intimal

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Case reports of traumatic abdominal aortic dissection

Author(s)	*Patient*		*Dissection*	*Symptoms*	*Treatment(s)*
	Age (y)	*Sex*			
Picard et al[5]	34	M	Ao—left CIA	Abdominal pain, etc	Wallstent
	41	M	Ao—both IAs	Abdominal pain; ischemia in both legs	Palmaz stent
	89	F	Ao—both EIAs	Ischemia in right leg	Wallstent
Peterson et al[6]	67	F	Ao—both IAs	Abdominal pain; ischemia in right leg	Fenestration →Wallstent, Palmaz stent
Nishimura (present case)	38	M	Ao	Abdominal pain; ischemia in right leg	Fenestration

Ao, Aorta; *CIA,* common iliac artery; *EIA,* external iliac artery; *IA,* iliac artery.

flap twice at 4 atm for 3 minutes (Fig 2). Fluoroscopy showed normal rapid enhancement of the right common iliac artery by contrast injection. Therefore, we judged the effect of fenestration to have been sufficient. The femoral pulse could be easily felt in the right groin, and the right ABI was elevated from 0.78 to 1.05. After this treatment, anticoagulant therapy was administered for 2 weeks.

Two years after the percutaneous operation, the patient had no complaints of intermittent claudication and was working without any associated problems.

DISCUSSION

There are two mechanisms of traumatic abdominal aortic injury, one involving a direct compression and the other involving an indirect sudden deceleration.[1] The incidence of such injures in all fatal motor vehicle accidents was 17.2%,[2] and death in the late period was caused by rupture of a false aneurysm.[1] However, traumatic abdominal aortic dissection is quite rare.[1] In general, 12% of patients with nontraumatic aortic dissection had some evidence of leg ischemia.[3] Surgical treatments for relief of lower extremity ischemia include percutaneous balloon fenestration, percutaneous stent placement, and prosthetic graft replacement.[1,4-6]

In this case, we had two opportunities to select treatment. At the initial operation, the patient immediately underwent a partial resection of the ileum and drainage for small intestinal injuries. If we had chosen direct operation, there would have been some possibility of artificial graft replacement. We would have been concerned about graft infection. Fortunately, however, using the intraoperative ultrasound technique we confirmed the absence of aneurysms and rupture, and the ABI of his right lower extremity remained at 0.7. Therefore, we decided not to treat the relative ischemia as an emergency situation.

At the second operation, we selected percutaneous balloon fenestration for this patient for three reasons. First, it was considerably difficult to fix a stent to the arterial wall of the border between the iliac artery and aorta (Table). Second, the aorta tended not to expand as we followed the patient's course through use of ultrasound after the initial operation. Third, there was an operative risk of sexual dysfunction. The patient was aged 38 years and in good health, but he was single and eager to have children in the near future. He was very worried about the possibility of sexual dysfunction as an operative complication when we explained the option of prosthetic graft replacement.

Fig 1. Aortography shows intimal flap between true lumen and false lumen and reveals that false lumen oppresses true lumen.

Percutaneous balloon fenestration is less invasive than other methods, but it has some disadvantages. In special situations, as in our case, this method may be effective. There are various methods of piercing the intimal flap for fenestration. We first tried to puncture the intimal flap with a Brockenbrough needle.

It is fortunate that good results were obtained

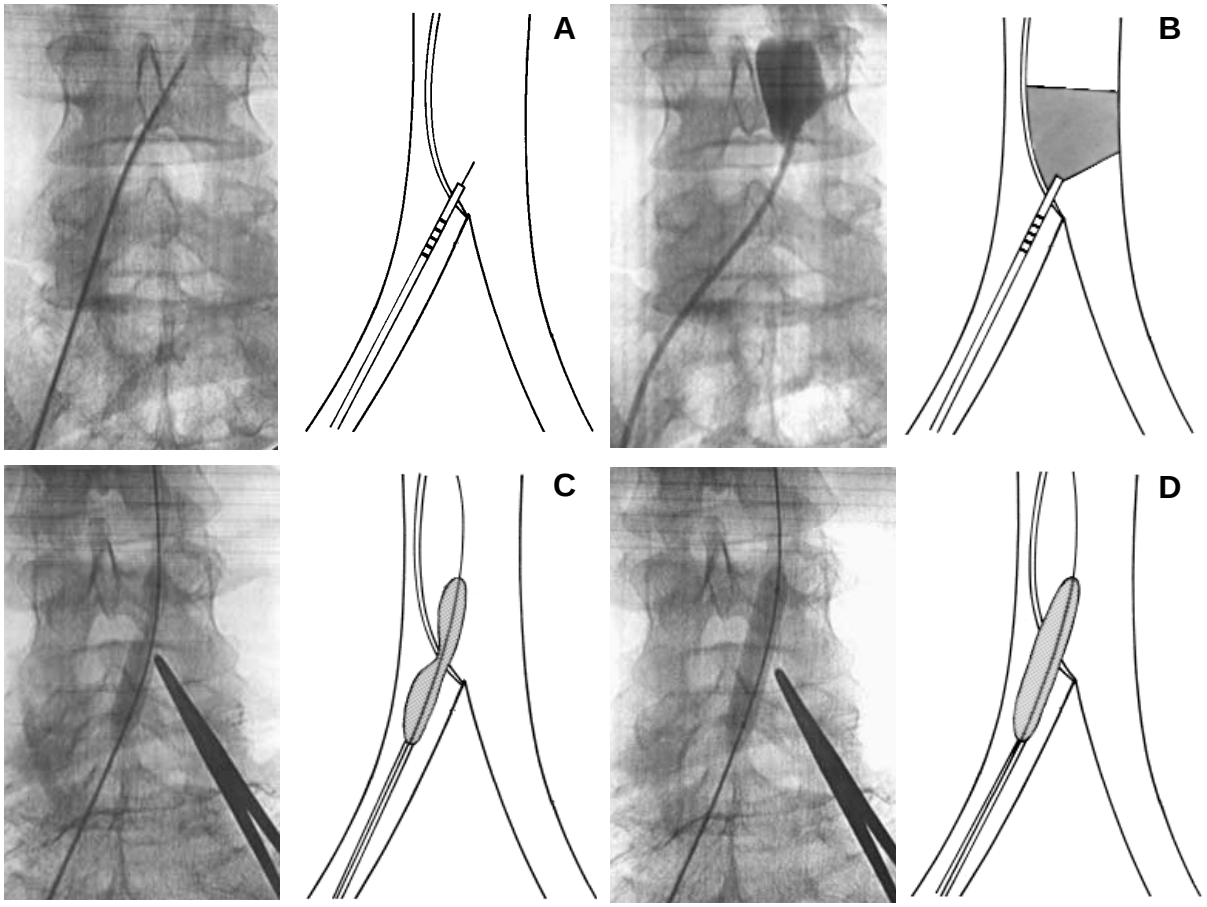

Fig 2. A, Puncture of intimal flap with Brockenbrough needle. B, Confirmation of false lumen by means of fluoroscopy. C, Angioplasty balloon catheter 9 mm in diameter and 4 cm in length is advanced over guide wire. D, Angioplasty balloon catheter is inflated against intimal flap.

in this case; the puncture with the Brockenbrough needle was not easy, because the dissected intimal flap was not fixed. We were able to properly puncture the flap under the guidance of intraoperative fluoroscopy. However, we think that the combination of intravascular ultrasonography and fluoroscopic guidance for puncture is a safer method.[4]

We successfully treated a patient with traumatic abdominal aortic dissection with percutaneous balloon fenestration. He has experienced no complications and has not required any ongoing medications. We continue to follow his course to determine whether the aorta has expanded.

CONCLUSIONS

We attempted percutaneous balloon fenestration for a patient with traumatic aortic dissection that had caused symptomatic ischemia of the right lower extremity; the results were good. This technique is one treatment option for traumatic aortic dissection in special clinical situations, as in the case described.

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